



ON LINE MS SERIES

Single phase in / Single phase out

MS1/2/3K

USER MANUAL

UNINTERRUPTIBLE POWER SUPPLY UPS

ENGLISH

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IMPORTANT SAFETY INSTRUCTIONS

*Save these instructions

This manual contains important instructions that should be followed during installation and maintenance of the UPS and batteries.

Important Notices:

- To ensure safety in all applications where an UPS is hard wired to the Electrical Supply, ensure that the system is installed by authorized staff.
- Those UPS systems supplied with a factory input lead can be safely connected to the wall socket by the purchaser.
- The UPS has its own internal energy source(battery). Should the battery be switched on when no AC power is available, there could be voltage at the output terminals.
- Make sure that the AC Utility outlet is correctly grounded.
- Do not open the case as there are no serviceable parts inside. Your Warranty will be void.
- Do not try to repair the unit yourself, contact your local supplier or your warranty will be void.
- Please make sure that the input voltage of the UPS matches the supply voltage.
- Use a certified input power cable with the correct plugs and sockets for the appropriate voltage system.
- To eliminate any overheating of the UPS, keep all ventilation openings free from obstruction, and do not store "things" on top of the UPS. Keep the UPS 20 cm away from the wall.
- Make sure the UPS is installed within the proper environment as specified. (0-40°C and 0-95% non-condensing humidity)
- Do not install the UPS in direct sunlight. Your warranty may be void if the batteries fail.
- Install the UPS indoors as it is not designed for installation outdoors.
- Dusty, corrosive and salty environments can do damage to UPS.
- Install the UPS away from objects which give off excessive heat and areas which are excessively wet.
- If liquids are split onto the UPS or foreign objects dropped into the unit, the warranty will be null and void.
- The battery will discharge naturally if the system is unused for any length of time.
- It should be recharged every 2-3 months if unused. If this is not done, then the warranty will be null and void. When installed and being used, the batteries will be automatically recharged and kept in top condition.
- This UPS supports electronic equipment in offices, telecommunications, process control, medical and security applications.

- This UPS has been designed and constructed to protect your assets from the wide range of power aberrations experienced on Utility power lines today. It is your insurance for reliable, clean and stable voltage supply. It is worth taking care to install the system correctly and to have it maintained correctly by your local distributor.

WARNING:

This is a Class A-UPS Product. In a domestic environment, This product may cause radio interference, in which case, The user may be required to take additional measures.

- Intended for Installation in a Controlled Environment.
- Servicing of Batteries Should be Performed or Supervised by Personnel Knowledgeable of Batteries and the Required Precautions. Keep Unauthorized Personnel Away from Batteries.
- When Replacing Batteries, Replace With the Same Number and Type.
- **CAUTION** – Do Not Dispose of Battery or Batteries in a fire. The Battery May Explode.
- **CAUTION** – Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.
- **CAUTION** – Risk of Electric Shock – Battery Circuit is not isolated from ac, hazardous Voltage may exist between battery terminals and ground. Test before touching.
- **CAUTION** – A Battery can present a Risk of Electrical Shock and High Short Circuit Current. The Following Precaution Should be Observed When Working on Batteries:
 - A. Remove watches, rings, or other metal objects.
 - B. Use tools with insulated handles.
 - C. Wear rubber gloves and boots.
 - D. Do not lay tools or metal parts on top of batteries.
 - E. Disconnect charging source prior to connecting or disconnecting battery terminals.
- **CAUTION** – To reduce the risk of fire, connect only to a circuit provided with 50 amperes maximum branch circuit over current protection in accordance with the National Electric Code, ANSI/NFPA 70.(3KVA)

INTRODUCTION

1.1. The General Characteristics

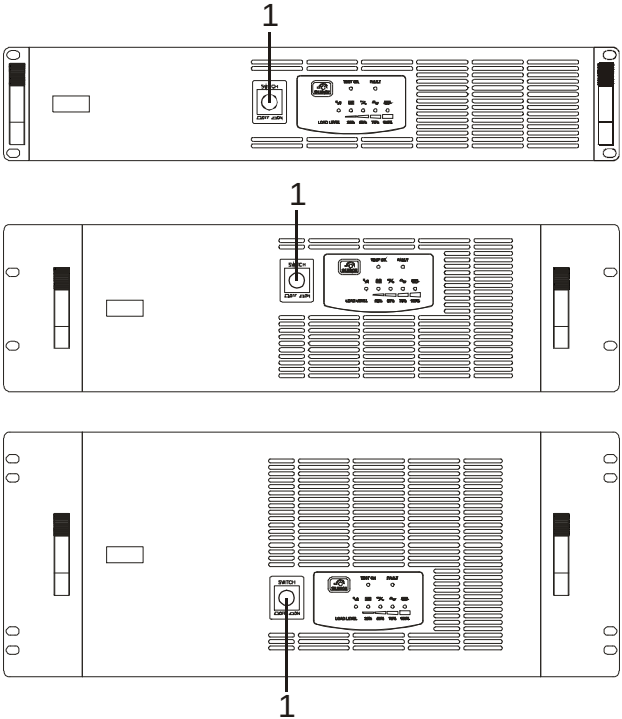
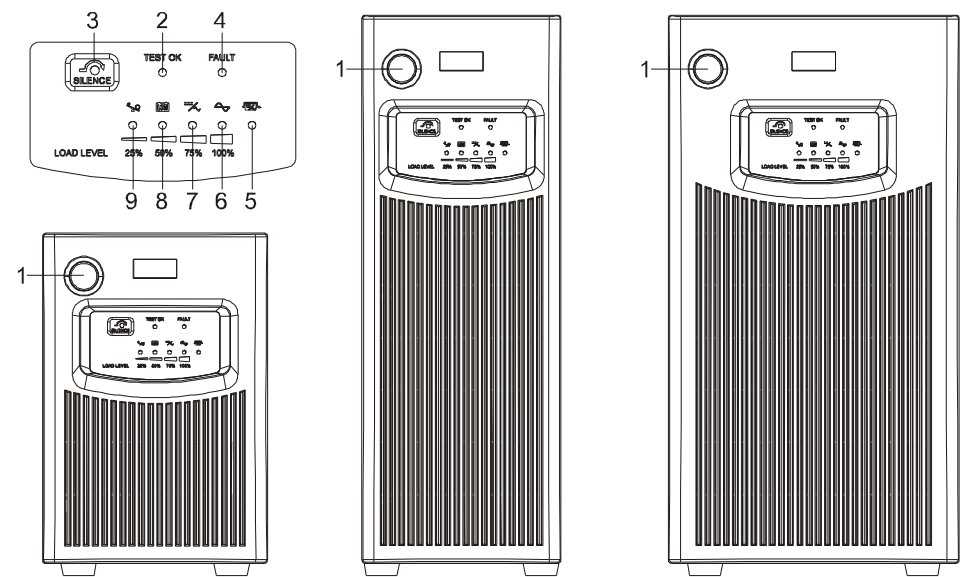
- True online architecture continuously supplies in your critical device with a stable, regulated, transient-free pure sine-wave AC Power.
- 50KHz PWM sine-wave topology yields an excellent overall performance.
- The high crest factor of the inverter handles all high-inrush current loads without a need to upgrade the power rating.
- To protect the unit from overloading, it automatically switches to bypass mode in case loading exceeds 120% of rating. It will automatically switch back to inverter mode once overload condition ceases.
- Should the output becomes short-circuited, the UPS holds the system and cuts the output automatically till the short circuit situation is removed.
- Should the unit become overheated, the internal thermistor will detect the heat and switch to bypass mode and vice versa.
- Maintenance-free sealed-type battery minimizes after-sales service.

1.2. The Advanced Technical Characteristics

- Market leading light and compact design for modern OA environment.
- Powerful CPU integrates all power stages, control and communication functions necessary for maximized UPS protection and functionality, including
Power management status monitoring, configuration setting operation
Scheduling, remote control and self-diagnosis.
- Slick CPU communication design allows full function remote control from any computer environment via standard RS-232 interface.
- State of the art IGBT Technology and Industrial Grade quality ensures Highest efficiency and reliability under tough operating condition.
- Industry leading inverter protection technology incorporates 2-stage output Current sensor, smart overload output current control, improved crest factor, and feedback failure proof circuit, elevating the availability of power service.
- Guarantees an exclusive protection against DC damage for inductive load, Such as motor based devices, entirely eliminating application limitation.
- Advanced Input PFC control guarantees the PF performance and maximum energy efficiency.
- Unique electronic over-current protection detects output short-circuit and faults, and halts output before damages done to output fuse or equipment, thereby minimizing the need for service.
- Expanded input voltage working range minimizes battery usage and enhances battery utilization and life.
- Automatic Frequency Sensor reduces troubles in frequency shift.
- Cold start function makes sure of the start-up of UPS during power outages.
- On-demand self-diagnosis function ensures UPS reliability and availability.
- Built-in supplementary charger enables speediest charging of external battery Bank.

Front and Rear Panel

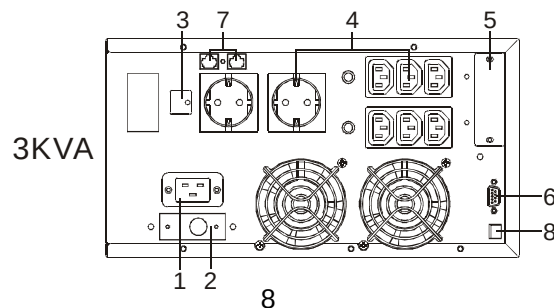
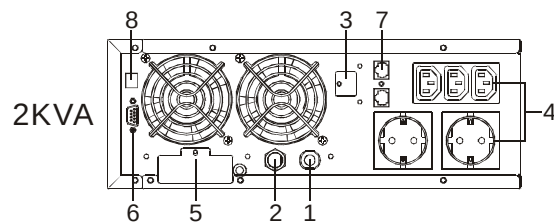
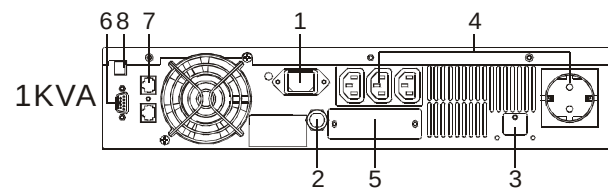
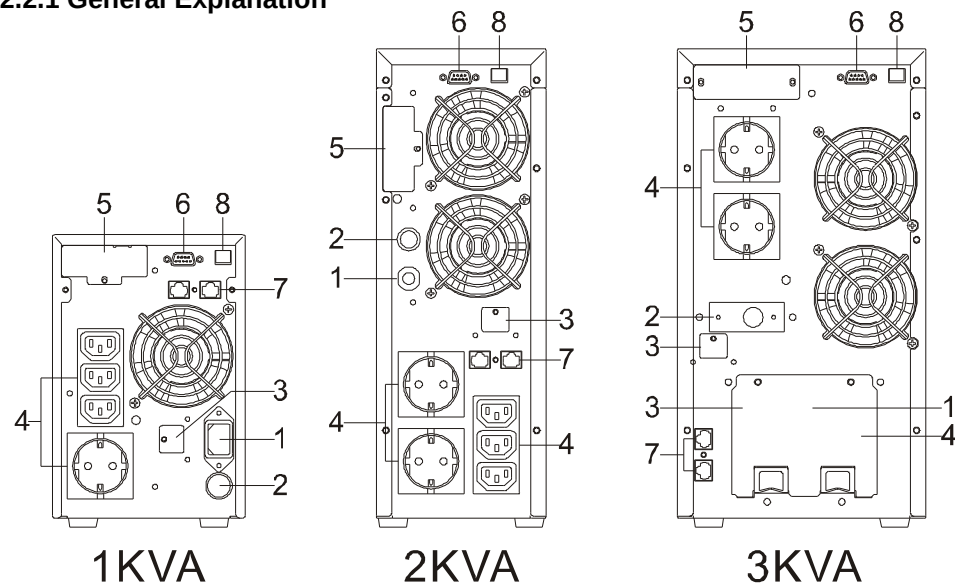
2.1. Front Display Panel Explanation



1.	Main Switch	This is control the on/off of the UPS
2.	Self Test OK LED	Green LED lights up if self test is O.K.
3.	Test/Silence	a. To silence alarm by pressing the button. b. To execute the self test of the UPS by pressing the button over 10 sec. c. To illustrate the percentage of output load level at AC Mode, and the battery energy level at Backup Mode by pressing the button.
4.	Fault LED	Red LED lights up if UPS is faulty.
5.	Bypass LED	Amber LED lights up when UPS is in Bypass mode.
6.	Utility LED	a. AC normal: Green LED lights up. b. 100% for load & battery level
7.	Inverter LED	a. Inverter On: Green LED lights up b. 75% for load & battery level.
8.	Battery low LED	a. Battery low : Red LED lights up b. 50% for load & battery level
9.	Over load LED	a. Over load condition: Red LED lights up b. 25% for load & battery level.

2.2. Rear Panel Explanation

2.2.1 General Explanation



1)	AC Inlet	This is to be connected with an AC power cord for plugging into the wall receptacle.		
2)	AC Input Fuse/ Breaker	This is to disconnect line input to protect application from Output overload or short circuit.		
		Fuse/Breaker Rating for 220V/230Vac systems		
		1KVA	2KVA	3KVA
		220V/230Vac: 10A/250V	220V/230Vac: 20A/250V	220V/230Vac: 25A/250V
3)	External Battery Terminal	This is a battery terminal to be connected with additional battery banks for longer backup time purpose. Only a qualified technician is permitted to proceed the installation.		
4)	AC OUTLET	Socket Type	1KVA	2KVA
		IEC	3pcs	3pcs
		Schuko Sockets	1pc	2pcs
				3KVA
				N/A
6)	Comm Port	This is an interface to send signals to and receive signals from the computer. An optional computer software may be required. Please refer to Chapter 2.3 for its pin assignments.		
7)	RJ11/RJ45 Jack	This is to offer you a modem/internet(RJ11) and 10-Base T Network(RJ45) protection against line interference.		
8)	DIP Switches	Only for manufacturer use		

2.3. Communication Port Explanation

The communication port on the rear panel of the UPS is a *true RS232 serial type*. It may be connected to a computer and allows the computer to monitor the status of UPS, and controls the operation of the UPS, via an additional UPS software kits. The bundled software of the UPS is for Windows environment, such as Windows 3.1, Windows 95 & 98, Windows NT. For other applications, such as Novell NetWare, Unix, etc., please contact your local distributor for a proper solution.

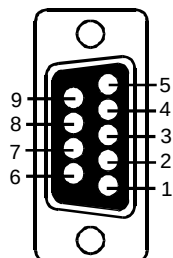
2.3.1. The RS232 interface settings

The RS232 interface shall be set as follows:

Baud Rate	: 2400 bps
Data Length	: 8 bits
Stop Bit	: 1 bit
Parity	: None

2.3.2. The Pin Assignments of true RS232 type

The Pin Assignments of true RS232 type are illustrated as follows:



Pin 6: RS232 Rx
Pin 9: RS232 Tx
Pin 7: Ground

Installation and Operation

The packing condition and the external outlook of the unit should be inspected carefully before installation. Retain the packing material for future use.

3.1. Unpacking

1. Take the UPS out of the PE foam.
2. Unwrap the UPS.
 - a. The UPS itself is approx. 12.5~39kgs, so be careful when unpacking and lifting the unit. Improper use of force might harm yourself.
 - b. The plastic bag holding the UPS is very slippery, so be careful in Unpacking and holding the unit. The unit might drop accidentally and harm yourself.
3. Standard Package includes:
 - User's Manual
 - AC Input Power Cord (Not available for hard wiring connection models)
 - IEC output cables (for the UPS with IEC sockets only)
 - RJ11 Phone Jack Cable
 - UPS communication kit (optional)

3.2. Selecting Installation Position

It is necessary to select a proper environment to install the unit, in order to minimize the possibility of damage to the UPS and extend the life of the UPS. Please follow the advice below:

1. Keep at least 20cm(8 inches) clearance from the rear panel of the UPS to the wall.
2. Do not block the air-flow to the ventilation openings of the unit.
3. Please check the installation site to avoid overheat and excessive moisture.
4. Do not place the UPS in an environment near dusty, corruptive or salty material or flammable objects.
5. Do not expose the UPS to outdoors.

3.3. Operation Test and Installation Instruction

The installation should be conducted or supervised by a qualified technician to avoid accident. Charge the UPS for more than 8 hours after unpacking to ensure the UPS is fully charged before usage.

1. Make sure the grounding of wall receptacle is properly done.
2. Verify if the voltage and frequency ratings match that of Utility, then connect the AC Input power cord to a verified grounded 3-wire receptacle.
3. Turn on the Main switch on the front panel to start the UPS, then the fan on the rear panel will spin.
4. After 7~10 seconds, the start-up of UPS will be completed, then the "Utility" LED and Inverter" LED will light up simultaneously.
5. Disconnect the input power cord of the UPS to see whether the UPS remains operation when Utility is abnormal.
6. Re-connect the input power cord of the UPS to wall receptacle, then connect the power cord of your device to the output receptacle of the UPS.
7. Turn on the Main switch on the front panel. The "Utility" LED and "Inverter" LED will light up in 7~10 seconds, then turn on the switch of the device connected. Do not execute any critical application yet!
8. Disconnect the UPS from the wall receptacle to simulate Utility failure. The "Utility" LED should extinguish and the alarm will sound continuously till battery cutoff. The device connected to the UPS shall operate continuously. To mute the audible alarm, please push the Test/Silence Button on the front panel.
9. Your installation is done successfully.

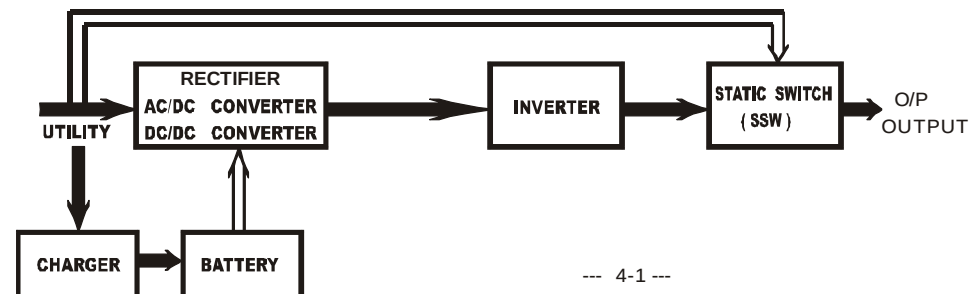
3.4. Storage Instruction

For extended storage through moderate climate, the batteries should be charged for 12 hours every 3 months by plugging the UPS power cord into the wall receptacle. Repeat this every 2 months under high temperature environment.

UPS Operation Principle

4.1. When Utility is Normal

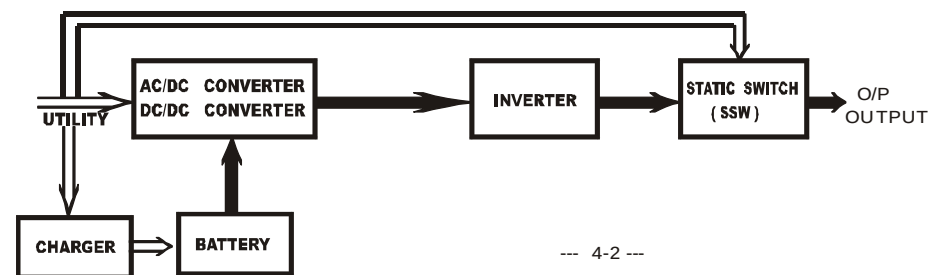
The working principle of the UPS under Utility normal condition is illustrated as follows,



When Utility is normal, the AC source is rectified to DC, partially fed into the charger to charge battery and partially fed into inverter. The inverter reverts the DC to AC to supply energy to the load connected. The Utility LED and Inverter LED Light up.

4.2. When Utility is Abnormal

The working principle of the UPS under Utility abnormal condition is illustrated as follows,



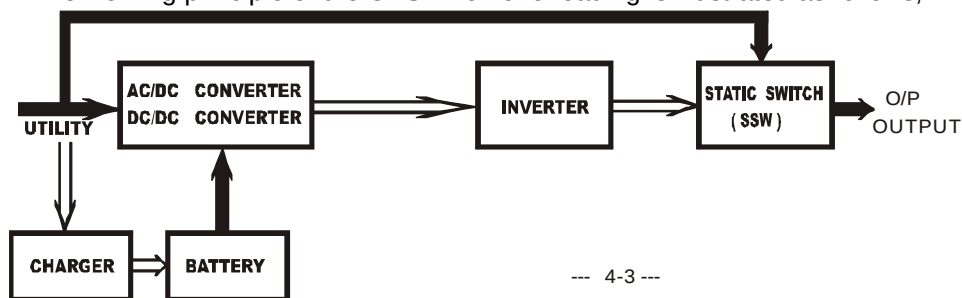
When Utility is abnormal, the UPS will use the battery energy automatically to energize the Inverter, and turn off the charger and AC/DC converter. The inverter revert DC to AC to supply energy to the output load connected. The Inverter LED lights up.

When Utility is back to Normal, the UPS will turn on the AC/DC converter, turn off DC/DC converter and turn back charger to charging position. It has the same working principle as figure 4.1.

During a blackout, the UPS will work as illustrated in figure 4.2. When Battery is low, buzzer will beep continuously till battery is completely cut off. The battery low protection of the UPS will cut off battery supply before battery drains to avoid from battery over-drain. The Inverter LED and Bat. Low LED will light up till the UPS is completely cut off. The UPS will re-start automatically when Utility is back to Normal. The working principle is the same as figure 4.1.

4.3. Overload Condition

The working principle of the UPS when overloading is illustrated as follows;

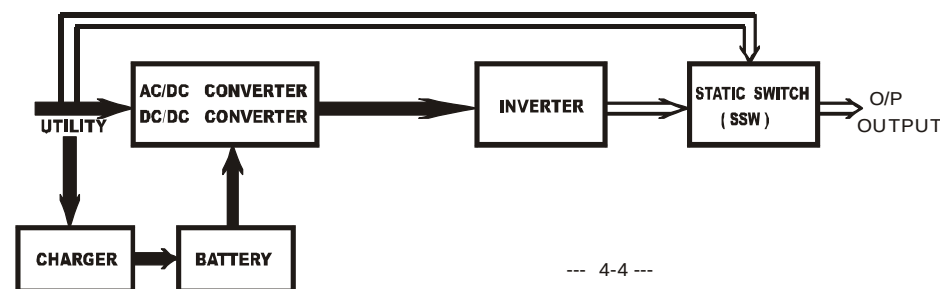


Normally, an inrush current is generated when switching on the connected device. If the UPS is in 105~120% loading, it will switch to bypass mode in 60 seconds. If The UPS is in 120%-150% loading, it will switch to bypass mode in 10 seconds. If The UPS is over 150% loading, it will switch to bypass mode immediately. The Utility LED, Bypass LED and Over Load LED light up. If overload condition is eliminated by reducing the load to 80%~90%, the UPS will switch back to Inverter mode automatically.

4.4. Inverter Failure

4.4.1. Output short circuit under inverter mode

If output load is short circuited under inverter mode, the UPS will turn off the output to prevent load from damage. The Fault LED lights up and the buzzer sounds continuously. The UPS can not turn on automatically after short circuit condition is eliminated. You are required to re-start the UPS manually. To re-start the UPS after short circuit condition is removed, you shall push the Main Switch on the front panel to "OFF" position first, then to "ON" position again.



4.4.2. Output Short circuit under bypass Mode

If output load is short circuited under bypass mode, the AC fuse will trip open to prevent the output load from damage. You shall replace a new fuse with same rating after the short circuit condition is eliminated.

4.5. Inverter Over temperature

If the UPS experiences over-temperature when Utility is normal, it will switch to bypass loop. The UPS will switch back to inverter mode when the over-temperature situation is eliminated. If it happens when Utility is abnormal, the buzzer will beep continuously and the Fault LED will light up. The output of the UPS will also be cut off.

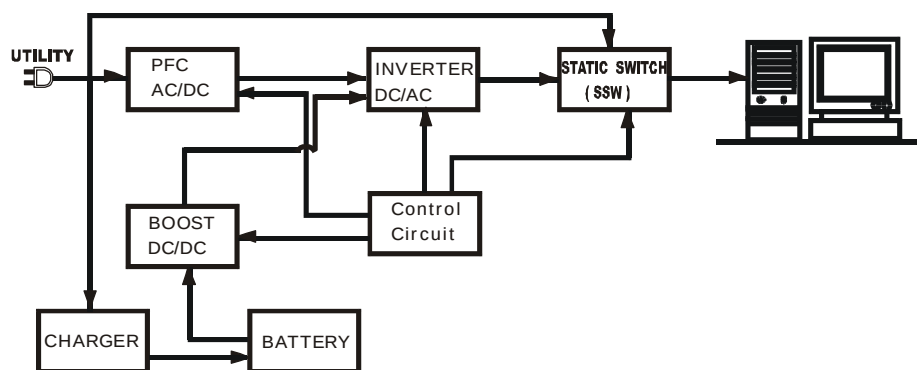
4.6. Inverter Over-current and Inverter Output Voltage Out of Window

If the UPS inverter delivers over-current and out-of-window voltage to output, the UPS is out of order. The UPS will switch to bypass loop when Utility is normal. The Utility LED, Bypass LED and Fault LED will light up.

If these two conditions occur when Utility is abnormal, the UPS will turn off the Output and the Fault LED will light up.

Maintenance Guide

5.1. System Block



5.2 Trouble Shooting

When the UPS malfunctions during operation, you may check the list Below for proper adjustment. Should the problem persists, please Contact your local distributor for help.

Situation	Check Items	Solution
Utility LED is not on and the UPS is on battery mode, when Utility is normal.	AC Input cord is loose or AC Input fuse is broken.	1.Connect the AC Input cord to wall receptacle. 2.Replace the AC fuse with same rating one. 3.If problem persists, please call for service.
The UPS switches to battery mode then back to Utility mode, when connected device is turned on. Or, the UPS Switches back and forth between battery and Utility.	3. Check if any power strip is connected to the UPS. 4. Any damage of Wall Receptacle.	1.Do not use power strip. 2.Replace the wall receptacle.
Overload LED lights up		UPS is overloaded. Please remove some load at the output end of the UPS till the RED LED extinguishes.

Situation	Check Items	Solution
Battery Low LED lights up		Battery is running out. Please proceed to shutdown your load & application Immediately then recharge the battery.
Fault LED lights up		Disconnect the output load immediately and re-switch on the UPS to see if the "Fault" LED Is still on. If not, your output load has probably been shorted. Otherwise, call for service.
System fails to backup when Utility fails.		Disconnect the input power cord from the rear panel and re-turn on the front Switch to see if the UPS is on again. If not, call for service.
UPS is normal but no Output to load	Check to see if all cords are properly connected as desired.	Check all outlets to see if they are properly connected.
Strange noise and smell		Immediately shut down the whole System. Disconnect the power from the UPS and call for service.

5.3. Maintenance

Clean the dust from the ventilation openings and intakes on the rear panel.

1. Turn off the UPS and wipe the casing with a damp cloth.
2. Periodically unplug the power cord of the UPS from the wall Receptacle to test the batteries condition.
3. Be sure you have already saved your application before you proceed the battery discharging capability test.

Technical Specifications

MODEL		1KVA	2KVA	3KVA
INPUT				
	Voltage (Vac)	160~280		
	Frequency (Hz)	50 / 60±5%(Auto Sensing)		
	Phase	Single		
	Input Power Factor	> 0.98(Full Load)		
OUTPUT				
	Voltage (Vac)	220/230/240		
	Capacity(VA/W)	1000/700	2000/1400	3000/2100
	Wave Form	Sine Wave, THD<3%(no load to full load)		
	Voltage Regulation	±2%		
	Frequency Stability	±0.5Hz (Free Running)		
	Synchronization	1 Hz/Sec. Slew Rate: Inverter Free Running If Input Frequency Over ±5% Range		
	Crest Factor	3 : 1		
	Transfer Time (Line Fault)	0 ms		
	Efficiency (AC to AC)	> 85%		
	Run Time(Full Load)	8 Min.	8Min.	7Min.
	Cold Start	Yes		
BATTERY				
	Type	Sealed Maintenance Free Lead Acid		
	Quantity (pcs)	3	6	8
	Voltage (Vdc)	36	72	96
	Recharge Time	8 Hours To 90%		
DISPLAY				
	LED	Utility, Battery Low, Inverter, Bypass, Self-Test, Load Level, Battery Level, Overload, Fault Conditions		

MODEL		1KVA	2KVA	3KVA
PROTECTION				
	Overload	100%~120% delay 60 seconds before switching to bypass; 120%~150% delay 10 seconds before switching to bypass; >150% immediately switch to bypass		
	Short Circuit	a) Inv. Mode: UPS shutdown and Cut the Output. b) Bypass Mode: AC Input fuse Breaks down.		
	Overheat	a) Utility Normal: Switch to Bypass. b) Utility Abnormal: Buzzer sounds continuously, Fault LED lights up then cut the output.		
	High Voltage Trip-Off	Switch to Backup Mode		
	Battery Low	Alarm continuously till battery cutoff		
	Noise Suppression	Comply with EN50091-2.		
	Spike Suppression	Comply with EN61000-4-5.		
ALARM				
	Audible and Visual	Line Failure, Battery Low, Transfer to Bypass, Overload, System Fault Conditions		
PHYSICAL				
	Dimensions (WxHxD, mm)	150x225x400	132x370x480	192x368x455
	Net Weight (Kgs)	15	27	36
ENVIRONMENT				
	Temperature	0C~40C		
	Humidity	0~95% RH Maximum, Non-Condensing		
	Noise	<45 dB (at 1 meter)		
COMPUTER INTERFACE				
	Interface Type	Standard RS232 Interface		
SAFETY CONFORMANCE				
	Safety Standard	EN50091-1		
	EMC Standard	EN50091-2		
	Marks	CE,		